

REMARKS/ARGUMENTS

It is believed that this application has been amended in a manner that places it in condition for allowance at the time of the next Official Action.

Claims 15-23 have been amended to more particularly point out and distinctly claim the present invention. Claims 24-27 have been canceled without prejudice.

New claims 28-38 have been added. Claims 28-38 are supported generally throughout the specification and by original claims 15-23. Moreover, the Examiner's attention is respectfully directed to page 10, line 19, to page 11, line 26 for additional support.

In the outstanding Official Action, claims 15-23 were rejected under 35 USC §112, second paragraph, as allegedly being indefinite. It is believed that the present amendment obviates this rejection.

As noted above, claims 15-23 have been amended to more particularly point out and distinctly claim the present invention. It is believed to be apparent that claims 15-23 have been amended in a manner that is definite to one of ordinary skill in the art.

Claims 15-16 were rejected under 35 USC §102(b) as allegedly anticipated by or, in the alternative, under 35 USC

§103(a) as allegedly obvious over WENZHI. This rejection is respectfully traversed.

Applicants believe that WENZHI fails to disclose or suggest the claimed invention. The claimed invention is directed to a sorbent suitable for use as a stationary phase in elution chromatography. The surface of the sorbent has a plurality of covalently bonded non-aromatic zwitterionic groups. The core of the sorbent consists of an organic resin. Applicants believe that WENZHI fails to teach a sorbent made of organic resin having a plurality of covalently bonded non-aromatic zwitterionic groups on its surface.

Indeed, all experiments disclosed by WENZHI are based on physically-adsorbed zwitterionic molecules. Applicants believe that the experiments relating to the separation of the enzyme  $\alpha$ -amalaze show that the large enzyme molecules elute almost immediately. One of ordinary skill in the art would understand that such a separation pattern from a desalting ion filtration column would not relate to the zwitterionic separation of the present invention.

While the Official Action contends that the phrase "through chemical reaction" by WENZHI indicates covalent bonding, the Official Action fails to provide any evidence to support this assertion. Thus, it appears that the Official Action relies on the teaching of the present application concerning zwitterionic

groups covalently bound to a carrier and then assumes that WENZHI also refers to zwitterionic groups covalently bound to a carrier.

Moreover, there are other alternatives available to one skilled in the art. In fact, a zwitterionic layer is formed when zwitterionic molecules are covalently bound to each other so that a zwitterionic layer may even enclose the entire carrier. Thus, a zwitterionic layer would be formed by a chemical reaction resulting in covalent bonds, but the zwitterionic layer would not be covalently bound to the carrier itself. Indeed, WENZHI only states that a zwitterionic layer is formed on the carrier through chemical reaction.

In fact, upon reviewing the entire disclosure of WENZHI, it is clear that a zwitterionic layer is formed on the surface of the carrier via a hydrophobic layer. The hydrophobic layer acts as an adhesive layer. As an example, WENZHI provides a carrier comprising porous silicon gel in a "zwitterionic stationary phase". On the surface of the carrier, a hydrophobic layer is formed. The zwitterionic layer is adsorbed and formed onto the surface of the hydrophobic layer. (See column 6, lines 24-25). Thus, WENZHI does not teach a sorbent wherein a plurality of non-aromatic zwitterionic groups are covalently bonded on the surface of the sorbent.

As WENZHI fails to disclose or suggest such a recitation, applicants believe that the Official Action can only

reach such a conclusion by relying on the teachings of the present specification. However, as the Examiner is aware, when imposing an obviousness rejection, one must look at a publication from the point in time prior to when the claimed invention was made; hindsight obviousness after the invention has been made is not the test. *In re Carroll*, 601 F.2d 1184, 202 USPQ 571 (CCPA 1979). Thus, any knowledge acquired by the Patent Office after applicants' filing date cannot be used as evidence of obviousness prior to applicants' filing date.

Moreover, while the Official Action contends that it would have been obvious to optimize the elements of WENZHI to enhance separation, applicants note that a particular parameter or element must first be recognized as a result effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum characteristic of said parameter element might be characterized as being obvious to optimize. *In re Antoine*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). In imposing the rejection, the Official Action fails to provide any evidence that any of the elements taught by WENZHI would be recognized by one of ordinary skill in the art as capable of being optimized. Thus, it is believed that WENZHI fails to disclose or suggest the claimed invention.

In view of the above, it is believed that WENZHI fails to anticipate or render obvious claims 15-16.

Claims 15-16 were further rejected under 35 USC §103(a) as allegedly being unpatentable over WENZHI in view of either YU, or YU and KURGANOV. This rejection is respectfully traversed.

Applicants believe that the cited publications of YU and KURGANOV, alone or in combination, fail to remedy the deficiencies of WENZHI. Neither YU nor KURGANOV disclose or suggest a sorbent suitable for use as a stationary phase in elution chromatography, wherein the core of the sorbent consists of an organic resin and the surface of the sorbent has a plurality of covalently bonded non-aromatic zwitterionic groups.

Thus, it is believed that the proposed combination fails to render obvious claims 15 and 16.

Claims 17 and 22 were rejected under 35 USC §103(a) as allegedly being unpatentable over either WENZHI alone or WENZHI in view of either YU or YU and KURGANOV as applied to claims 15 and 16 above, and further in view of VIKLUND. This rejection is respectfully traversed.

As noted above, the cited publications of YU and KURGANOV, alone or in combination, fail to remedy the deficiencies of WENZHI. As to VIKLUND, the Official Action contends that it would have been obvious to polymerize zwitterionic groups to a carrier because VIKLUND discloses that the attachment of reactive polymer chains dramatically increases the surface group density of a carrier. However, VIKLUND relates

to a porous monolithic column grafted with the cationic group 2-acrylamido-2-methyl-1-propane sulfonic acid and not zwitterionic compounds (see page 2, line 27 to page 3, line 2). Thus, it is believed that the cited publications of WENZHI, YU, KURGANOV, and VIKLUND, alone or in combination, fail to render obvious claims 17 and 22.

In the outstanding Official Action, claim 18 was rejected under 35 USC §103(a) as allegedly being unpatentable over WENZHI. The Official Action further contends that claim 18 is unpatentable in view of either YU alone, or YU in view of KURGANOV and VIKLUND, and further in view of HATCH. This rejection is respectfully traversed.

Applicants believe that the cited publications of WENZHI, YU, KURGANOV, and VIKLUND, alone or in combination, fail to disclose or suggest the claimed invention for the reasons cited above. The Official Action contends that HATCH discloses a cross linking zwitterionic chains effect that are adsorption characteristics. However, HATCH fails to disclose or suggest a sorbent suitable for use as a stationary phase in elution chromatography wherein the sorbent has a core consisting of an organic resin or that the sorbent has a plurality of non-aromatic zwitterionic groups covalently bonded on the surface of the sorbent. Thus, it is believed that the proposed combination fails to render obvious claim 18.

Claims 19-21 and 23 were rejected under 35 USC §103(a) as allegedly being unpatentable over WENZHI. Claims 19-21 and 23 were then further rejected as allegedly being obvious over WENZHI in view of either YU (*Journal of Chromatographic Science*, Vol. 24, May 1986, pp. 177-182) or YU (*Journal of Chromatographic Science*, Vol. 27, April 1989, pp. 176-185) and KURGANOV as applied to claims 15 and 16, and further in view of KURGANOV and YANG. Applicants respectfully traverse these assertions.

The Official Action contends that at best, the claims differ from either WENZHI in view of either YU (*Journal of Chromatographic Science*, Vol. 24, May 1986, pp. 177-182) or YU (*Journal of Chromatographic Science*, Vol. 27, April 1989, pp. 176-185), and KURGANOV in reciting surface activation. However, once again, none of the cited publications disclose a sorbent having a plurality of non-aromatic zwitterionic groups covalently bonded on its surface. Thus, in view of the deficiencies of the cited publications, it is believed that the rejection must be withdrawn.

In the outstanding Official Action, claims 15-17 and 22 were then rejected under 35 USC §102(b) as allegedly anticipated by or, in the alternative, under 35 USC §103(a) as allegedly obvious over VIKLUND. However, while the Official Action alleges that VIKLUND is a publication of relevance, applicants believe that VIKLUND fails to disclose or suggest the claimed invention.

VIKLUND relates to a porous monolithic column grafted with the cationic group 2-acrylamido-2-methyl-1-propane sulfonic acid and not zwitterionic compounds. As evidence of this assertion, the Examiner's attention is respectfully directed to page 2, line 27 to page 3, line 2. Thus, VIKLUND fails to teach the claimed sorbent or provide one of ordinary skill in the art the necessary motivation and reasonable expectation of success of modifying the teachings of the publication to obtain the claimed invention.

Moreover, while the Official Action contends that it would have been obvious to optimize the elements of VIKLUND to enhance separation, the Official Action fails to provide any evidence that VIKLUND considers these elements capable of being optimized. Thus, it is believed that VIKLUND fails to anticipate or render obvious the claimed invention.

Claim 18 was rejected under 35 USC §103(a) as allegedly being unpatentable over VIKLUND in view of HATCH and KURGANOV. This rejection is respectfully traversed.

As noted above, these publications do not disclose any carrier onto which zwitterionic moieties have been covalently bound. Thus, it is believed that the rejection is improper and must be withdrawn.

Claims 15 and 16 were rejected under 35 USC §102(b) as allegedly being anticipated by, or in the alternative, under 35

USC §103(a) as allegedly obvious over METZ. This rejection is respectfully traversed.

Applicants believe that METZ fails to anticipate or render obvious the claimed invention. Applicants believe that METZ fails to disclose or suggest the claimed invention. METZ relates to a cellulose powder and not to a resin. One of ordinary skill in the art would not consider cellulose powder as a resin. In support this assertion, applicants attach page 90 from Ullman's Encyclopedia of Industrial Chemistry, Vol. A23 (1993) showing a classification of natural and synthetic resins.

Thus, the cellulose powder of METZ cannot be used in HPLC equipment. Indeed, by using a resin, it is possible to run separation at a considerably higher pressure which reduces the separation time yet increases the quality of the separation process.

Moreover, upon carefully considering METZ, none of the examples by METZ disclose a separation involving an amphotERICALLY or zwitterIONICALLY modified resin. Thus, while it is true that METZ teaches a method for manufacturing a cellulose powder comprising amphoteric groups, one of ordinary skill in the art would consider this powder quite distinct from the sorbent of the claimed invention.

Moreover, even in combination with WENZHI, one of ordinary skill in the art would still not obtain the claimed

invention. As noted above, WENZHI does not disclose a covalent attachment of zwitterionic groups to the carriers. Thus, it is believed that WENZHI fails to remedy the deficiencies of METZ.

Claims 15 and 16 were rejected under 35 USC §102(a) and/or (b) as allegedly anticipated by or, in the alternative, under 35 USC §103(a) as allegedly obvious over GROTE. This rejection is respectfully traversed.

GROTE relates to sorbents on which aromatic zwitterionic groups have been covalently bound. Thus, GROTE fails to teach covalently bonded non-aromatic zwitterionic groups. Moreover, GROTE is focused on separating and recovering gold and other precious metals from solutions of inorganic salts. GROTE fails to even mention or suggest the separation of proteins. Thus, it is believed that GROTE fails to anticipate or render obvious the claimed invention.

In view of the present amendment and the foregoing remarks, therefore, it is believed that the present application is now in condition for allowance, with claims 15-23 and 28-38, as presented.

Allowance and passage to issue on that basis are accordingly respectfully requested.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any

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overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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ATTACHMENT(S):

Ullman's Encyclopedia of Industrial Chemistry, Vol. A23  
(1993), page 90 showing a classification of natural and synthetic  
resins.

# **Ullmann's Encyclopedia of Industrial Chemistry**

**Fifth, Completely Revised Edition**

**Volume A 23:**

**Refractory Ceramics to Silicon Carbide**

**Editors: Barbara Elvers, Stephen Hawkins,  
William Russey, Gail Schulz**



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and varnishes—Vocabulary—Part 3: Terminology of resins), resins are defined similarly, i.e., as solid, semisolid, or pseudosolid organic materials that have an indefinite and often high relative molecular mass, and generally soften or melt over a range of temperatures on heating. Very often, the term resin is also used to designate any polymer that is a basic material for plastics (e.g., polyethylene resin, → Plastics, General Survey). In the German standard DIN 55958, resin ("Harz") is defined as a collective term for solid to liquid organic products. Their molecular mass distribution can vary within wide limits. Resins include a large variety of organic substances of different chemical composition, but with many similar physical properties.

Generally, resins are products with medium molecular mass. Their average molecular mass does not exceed 10000 and, in most cases, is even lower. Resins have an amorphous and often complex structure. They do not exhibit a sharp melting point, but like every amorphous polymeric system, resins have a glass transition temperature and are characterized by their softening point, which denotes the transition temperature from a pseudosolid to a plastic state on heating.

Resins can be subdivided into natural and synthetic resins.

**Natural Resins.** In ISO 4618/3, natural resins are defined as resins of vegetable or animal origin. The term includes rosins (gum, wood, or tall-oil rosins from tree and plant exudates; wood extracts; or byproducts from paper manufacturing), fossil resins such as amber; mined resins such as asphaltite; shellac as secretion product from an insect; and their main derivatives.

**Synthetic Resins.** In ISO 4618/3, synthetic resins are defined as resins resulting from controlled chemical reactions such as polyaddition or polycondensation between well-defined reactants that do not themselves have the characteristics of resins. Synthetic resins are also obtained by polymerization (ISO 472) of unsaturated monomers. This term includes two subgroups:

- 1) *Hydrocarbon resins*, i.e., synthetic resins from coal tar, petroleum, and turpentine streams, produced by polymerization. These resins are used like natural ones, e.g., in combination with other polymers to impart special properties such as tack, flow, and hardness to a material.

2) *Synthetic resins* obtained mainly by addition polymerization and polycondensation, which are intermediates in the synthesis of higher molecular mass plastics.

Resins may be further classified:

- 1) By origin: natural or synthetic resins; petroleum, terpene, or coal-tar resins (indene-coumarone resins, α- and β-resins in coal-tar pitch)
- 2) By physical condition: liquid, soft, or hard resins
- 3) By the reaction mechanism of their production or processing: resins from polyaddition, polymerization, or polycondensation
- 4) By application and processing: resins for paints and varnishes or printing inks; tackifying, casting, laminating, or impregnating resins
- 5) By other characteristics: thermosetting, thermoplastic, saponifiable resins, etc.
- 6) By the intended modification of product properties: tackifier, plasticizer, processing aid, fixing resin, etc.

Chapter 2 of this article covers the hydrocarbon resins as synthetic resins obtained by polymerization; Chapter 3 deals with furan, ketone, and polyamide resins as synthetic resins obtained by polycondensation. For natural resins, see → Resins, Natural, pp. 74–79.

## 2. Resins by Polymerization [2.1]–[2.8]

### 2.1. Classification

The term hydrocarbon resin is generally applied to low molecular mass thermoplastic polymers that are composed mainly of carbon and hydrogen. With respect to their origin, hydrocarbon resins can be classified in four main groups:

- 1) Petroleum hydrocarbon resins, derived from cracked petroleum distillates
- 2) Indene-coumarone resins, based on coal-tar oils
- 3) Terpene resins from turpentine fractions
- 4) Resins from pure monomers

The oldest family of hydrocarbon resins is the indene-coumarone resins, discovered by KRÄMER and SPILKER in 1890, and produced on